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Noise Element

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1975

Contra Costa County, California

Noise Element

1975

Contra Costa County, California

Adopted August 12, 1975
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Prepared by
CONTRA COSTA COUNTY PLANNING DEPARTMENT

NOISE ELEMENT

A Part of the General Plan of
Contra Costa County, California

prepared by the
Contra Costa County Planning Department
May 1975

County Pl. Contra Costa Co.
City Pl. Noise abatement

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INTRODUCTION

In response to the growing problem of environmental noise and in recognition of the important role of planning in determining the community noise levels, the California Legislature in 1972 added section 65302(g) of the Government Code which requires cities and counties to adopt a Noise Element as part of their General Plan. The Noise Element is intended to add the consideration of noise and noise related problems to the scope of a city or county General Plan. This Noise Element has been developed to provide a noise policy for Contra Costa County, and to furnish a means for coordination between the County and other jurisdictions engaged in planning and implementing actions to mitigate noise impacts. Among these agencies is the State of California's Department of Transportation, which is providing noise barriers along existing State routes. Coordination is also needed with cities of Contra Costa County which are preparing their own noise elements to comply with the State legislation.

The firm of Earth Metrics, Incorporated was retained to provide technical support to the Planning Department in the preparation of the detailed noise information and noise contours.

While "noise" emanates from diverse sources, this element focuses on noise generated by transportation related activities. This initial Noise Element will later be refined to include a more detailed discussion of noise not attributable to transportation.

In some instances maps of this document show contours within municipal limits. Where contours are thus shown in incorporated areas, it is understood that these contours are included for continuity and coordination purposes and that the respective cities' standards and requirements, rather than the County's, are applicable to these road segments.

The legal basis for this element is provided by the Government Code, which mandates:

A noise element in quantitative, numerical terms, showing contours of present and projected noise levels associated with all existing and proposed major transportation elements. These include but are not limited to the following:

1. Highways and freeways
2. Ground rapid transit systems

3. Ground facilities associated with all airports operating under a permit from the State Department of Aeronautics.

These noise contours may be expressed in any standard acoustical scale which includes both the magnitude to noise and frequency of its occurrence.

The recommended scale is sound level A, as measured with A-weighting network of a standard sound level meter, with corrections added for the time duration per event and the total number of events per 24-hour period.

Noise contours shall be shown in minimum increments of five decibels and shall be continued down to 65 db(A). For regions involving hospitals, rest homes, long-term medical or mental care, or outdoor recreational areas, the contours shall be continued down to 45 db(A).

Conclusions regarding appropriate site or route selection alternatives or noise impact upon compatible land uses shall be included in the general plan.

The state, local, or private agency responsible for the construction or maintenance of such transportation facilities shall provide to the local agency producing the general plan, a statement of the present and projected noise levels of the facility, and any information that was used in the development of such levels.

The State Council on Intergovernmental Relations has provided guidelines regarding the scope and nature of the noise element. It recommended that the Element contain:

1. A statement of general policy indicating the local jurisdiction's general intentions regarding noise and noise sources in the community.
2. Desired maximum noise levels by land use categories.
3. Standards and criteria for noise emissions from transportation facilities. (It should be noted that control of some noise sources has been preempted by State and Federal governments.)
4. Standards and criteria for compatible noise levels for local "fixed-point" noise sources.
5. Guide to implementation.
6. Appendix describing methodology of preparation and sources of data.

This Noise Element meets both the legal mandate and the guidelines established by the State Council on Intergovernmental Relations. It is designed to serve the following purposes:

- To comply with State laws requiring cities and the County to adopt a noise element.
- To define the existing and future transportation noise problems in the County.
- To specify the noise control goals and objectives of the County.
- To provide a means of implementing the County's noise control goals and policies.
- To coordinate the County's noise control programs with other units of government.
- To act as a catalyst and a frame of reference for the development of cities' noise control programs.
- To provide a mechanism to combine noise impact review with the general project review functions of the County.

The adoption of this plan establishes County policy toward transportation related noise, it relates this policy to other obligations of the County, and presents a generalized guide to implement this policy. Lastly, it provides a basis for the review of public projects that would effect noise conditions.

DEFINITIONS

The definitions listed below are generalized and are intended to assist in understanding basic technical terms used in this element.

Sound

Energy in the form of pressure waves transmitted through air or other media. Characterized by intensity, pitch (or frequency), and duration.

Noise

Most commonly defined as "unwanted sound", however, this definition depends on human subjectivity and thus may vary considerably depending on the individuals involved. A more suitable definition for noise is any sound energy which has a detrimental effect on human health or which constitutes an annoying intrusion into the living environment.

Decibel (dB)

A convenient scale for expressing sound intensity. Such a scale is needed because the human ear is sensitive to an extremely wide range of sound pressure levels (intensity). The decibel scale is a logarithmic scale based on pressure levels, and is expressed in a range of 0 to 140. Zero decibels is the lowest level of sound detectable by the human ear, while a jet aircraft takeoff at 200 feet measures approximately 120 dB. Typical outdoor levels in urban environments vary from 50 to 80 dB. An increase of 10 dB is usually perceived as a doubling of sound intensity (loudness).

A-weighted Sound Level (dBA)

This is similar to the standard unweighted decibel scale (dB) described above. It differs in that the lower and higher frequency components of sound are deemphasized to reflect the response characteristics of the human ear. An A-weighted sound reading is a better representation of the actual human perception of sound.

Equivalent Sound Level (L_{eq})

In cases where the sound level varies over time, the total sound energy is measured and an equivalent continuous level is computed. This level can be thought of as a continuous tone having the same energy content as the time-varying sound.

Community Noise Equivalency Level (CNEL)

This is a modification of the equivalent sound level described above, and is intended to reflect the total noise environment for an entire day. Basically it is a 24 hour L_{eq} , with emphasis placed on the noise occurring in the evening and night hours. The evening noise levels are increased by 3 dBA, while the night levels are increased by 10 dBA. In urban areas the CNEL typically varies from 45 to 75 dBA.

Speech Interference

The degree to which noise reduces intelligibility of voice communication. This is usually measured in terms of the percentage of key conversational words masked by the background noise. Casual conversation can usually be conducted at a 5 to 10 percent masking rate, since the subject matter is usually familiar and the style of speech contains redundancies. However, educational experiences such as classrooms or televised instruction usually demand 100 percent intelligibility; that is, all of the key words must be understood.

Noise Contour Map

A map containing lines which pass through points having the same noise levels. Contours can be drawn for any of the noise equivalency scales, including CNEL. Such contours delineate bands of varying width surrounding or paralleling the noise source.

THE EFFECTS OF NOISE

Noise effects people in three basic ways: it is detrimental to their health, it interferes with their activities, and it reduces their economic potential.

1. Health Effects

Noise can affect the health of people to a widely varying extent, depending on the intensity. The impact can range from mild involuntary physiological reactions to permanent injury or even death. Hearing loss due to noise is a well documented phenomenon, and precise noise levels which cause this loss are established. Hearing loss is usually defined as a permanent shift in the threshold of hearing, and is manifested by an inability to perceive low intensity sound. Levels of sound well below that which causes hearing loss have been observed to cause cardiovascular effects in humans, including constriction of blood vessels and dilation of pupils. Most people in the United States suffer measurable hearing loss with advancing age: most of this loss is due to exposure to routine urban noise levels.

2. Interference Effects

Noise interferes with human activities in a variety of ways intruding upon the total quality of life. Perhaps one of the more serious is disturbance of sleep; specific sound levels for this effect have also been established. Interference with speech communication is also a common problem; and specific sound levels have been associated with varying degrees of speech intelligibility. Annoyance effects due to noise have also been quantified in terms of the percentage of persons who can be expected to complain for any given noise level. Noise can also interfere with cultural or leisure activities; for example, it detracts from the appreciation of park lands, historic sites, and other outdoor activities.

3. Socioeconomic Effects

Noise can have several effects with social or economic implications. These include reduced productivity of workers and students in both their jobs and in the schoolroom, as well as indemnity payments for work-related hearing loss. The value of residential properties can be adversely effected by noise due to reduced livability, reduced salability, transition of homes from owner to rental status, conversion to nonresidential uses, and pressures for change to other land uses.

4. Other Effects of Noise

Most studies of environmental noise have been concerned with the urban environment and the effects of noise on people. However, there is a growing awareness of the need to study the effects of noise on other elements of the environment. How does noise affect the populations of predatory mammals, wild fowl, and beneficial insects? What are the noise effects on sensitive archaeological structures and delicate geological formations? These and other questions pose typical issues regarding man's total responsibility toward the environment.

NOISE PROBLEMS IN CONTRA COSTA COUNTY

The sources of community noise in Contra Costa County can be classified into two groups--mobile (or line) sources, and fixed point sources. The mobile sources include freeways, highways, transit vehicles and aircraft. Fixed point sources include industries, commercial establishments, individual residences, some recreational facilities, public transportation terminals, railroad yards, and airport ground facilities.

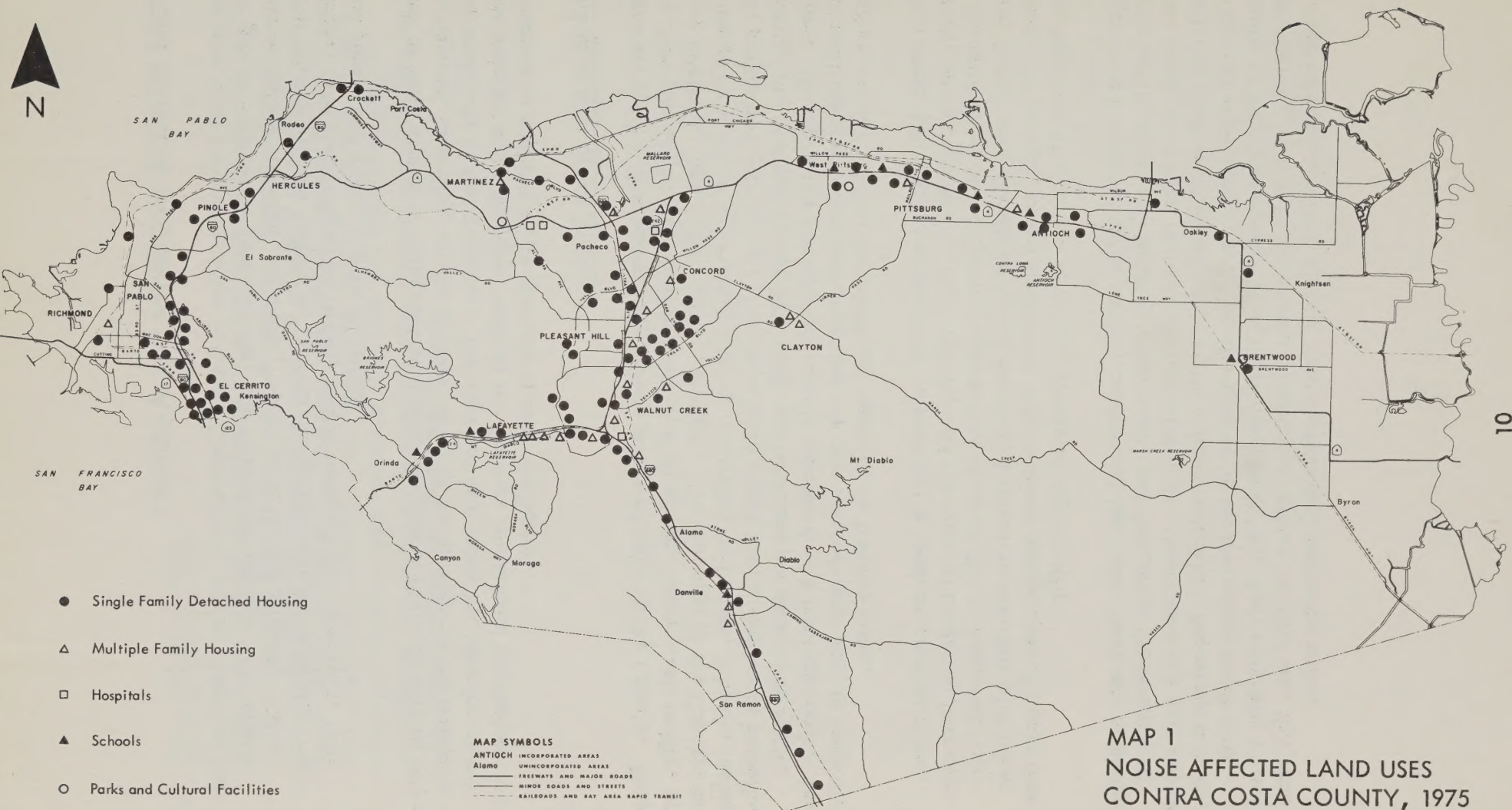
Each of these classes of noise sources affects the people in the County to varying degrees, depending on the characteristics of the source and the proximity and sensitivity of the receptors. The attached map shows the location of the most severely noise impacted areas in the County. Additional background information to evaluate these problems is provided below.

Mobile or Line Noise Sources

Freeways are the most pervasively intense source of noise in the County. They are characterized by high traffic volumes, high speeds, heavy truck traffic, and carry relatively high traffic volumes at night. The freeways in the County, are bordered by a mix of land uses including industries, businesses, schools, residences, parks, and open space. The majority of single family residences bordering freeways are oriented so that rear yards and bedrooms are exposed to traffic noises. Homes facing freeways are usually separated by a frontage roads. Several multiple story apartment structures are also located very close to freeways. Further, several schools and parks are impacted by freeway noise.

Major roads differ from freeways with respect to the roadway configuration, speeds, percentage trucks, night traffic, and the types of bordering land uses. In the open areas of the County, speeds tend to be similar to freeways; however, in the more developed areas, the roads function as arterials with lower speeds. In general, major roads tend to have lower percentages of trucks than freeways, and also have a lower percentage of night traffic.

Major road frontages tend to contain commercial land uses; however, numerous single family homes still exist on these roads, and frequently the setbacks of these homes have been reduced by road widenings. Apartments are very common along this class of road, very often with minimal setbacks. Numerous schools, parks, and other public facilities also tend to be located along major roads. Because of the large number of miles of these facilities, their proximity to residents and the relatively large areas of adjacent residential land use, this class of noise sources constitute a major contribution to Countywide noise.



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Aircraft noise is not considered a significant problem in the County at this time. Most of the aircraft operating over the County are of the single engine type flown by noncommercial pilots. High performance twin engine aircraft and "executive" jets operate over the County only occasionally. Commercial airliners fly at high altitude while over the County and do not create a major noise problem. Minor noise impacts caused by light aircraft occur in the immediate vicinity of Buchanan Field, primarily due to the high volume of training flights associated with take-off and landing practice. These "touch-and-go" activities are usually flown at an altitude of 800 feet over populated areas, and although they do not significantly affect human activities, they are noticeable to some of the families living directly under the flight patterns.

Railroad operations are divided into two categories--lines and yards. The noise impacts along lines depend on the number of trains per day, the number of night operations, the length of trains, and their speeds. Railroad lines pass through several existing communities in the County, and through some unpopulated areas with potential for future development.

The Bay Area Rapid Transit System has a varying impact in the County, depending on the physical configuration of the system and the types of land uses affected. BART is primarily elevated on the Richmond line and impacts a significant amount of the older sections of El Cerrito and Richmond. On the Concord line BART's configuration is highly variable--elevated, at grade, depressed, and in a tunnel. Also, the line follows the median of State Highway 24 from Orinda to Walnut Creek, and consequently the noise in this section adds to the freeway impact. Beyond Walnut Creek BART creates several significant impacts in residential neighborhoods, and one public park in Concord is very near the elevated line. BART's overall noise impact is expected to increase in the future, when weekend and night services are initiated. While the individual noise level resulting from train passage will not necessarily increase, exposure throughout the day will be longer.

Fixed Point Noise Sources

Industries are commonly thought of as heavy noise generators, however, they seldom pose a problem from a community noise point of view. For the most part, heavy industries in the County are located along the Carquinez Strait, Suisun Bay, and San Pablo Bay. This setting provides a separation from the more populated inland areas. Even where communities along the shoreline are near the industrial areas, these industries are seldom a significant factor in their noise environment.

Commercial business establishments have some potential for noise impacts due

to their integration into residential areas. In general, however, the more disruptive commercial land uses are not permitted in districts zoned for neighborhood business, and are only allowed in other commercial districts under land use permits. The principal noise impact of commercial business is due to its traffic generating potential--both patrons and truck deliveries. Also some noise is generated by auxiliary equipment such as refrigeration plants and air conditioning equipment.

Residential areas also generate noise and contribute to the total noise exposure of the population. Outdoor noise is primarily due to motor vehicles, power equipment, and other construction and maintenance activity and noise from children. Noise levels inside dwellings are generally higher than outdoor levels, except in cases where residences are exposed to heavy traffic. Investigations have shown that in "quiet" neighborhoods indoor levels tend to be about 2 dBA higher than outdoor levels.

Recreational facilities can cause significant noise problems under certain circumstances. This would include active recreational activities such as outdoor play areas, athletic facilities, motor sport parks, and outdoor concert facilities in addition to vehicles attracted to the facilities. In general, recreation-generated noise is confined to daylight hours. However, since it tends to be more severe on weekends, it can be annoying to nearby residents.

Public transportation terminals are significant sources of noise due to their traffic generating potential, and general level of activity. Rapid transit stations are a particular problem since they are expected to operate on a 24 hour basis. Public address loudspeakers are used to inform patrons of special conditions or procedures, and the use of these speakers at night is a potential problem for residents of nearby homes.

Railroad yards are characterized by noise from idling locomotives, car coupling impacts, car retarders (in hump yards), idling refrigeration cars, maintenance operations, and locomotive load testing. The only significant yard operations in the County occur at the Santa Fe yards in Richmond. This yard is located in an industrial area and does not present a significant noise problem. Line operations pose a more widespread annoyance, especially where warning whistles are used for grade crossings.

Airport ground operations consist primarily of maintenance, repair work, and aircraft run-ups. Neither of the airports in the County generate a significant amount of noise from these operations.

GOALS, OPERATIONAL OBJECTIVES, AND POLICIES

Noise, especially noise generated by transportation sources, is ever present in urban and suburban life. The main concern, however, is with the quality and level of sound and the place where it is perceived.

People react to noise according to an area's setting; people may love the "hustle and bustle" of a city, while objecting strenuously to noise in a rural parklike setting. However, at certain levels of noise continued exposure will be detrimental to the average person's health or his ability to function efficiently. The following goals, operational objectives, and policies have been developed to deal with the negative impacts of noise.

Goals

1. To improve the overall environment by reducing annoying and physically harmful levels of noise for existing and future residents, and for all land uses in the County.
2. To maintain appropriate noise conditions in the existing residential, recreational, and rural areas of the County.
3. To maintain appropriate noise conditions adjacent to the community facilities of the County.
4. To ensure that new developments will be constructed so as to limit the effects of exterior noise on future occupants.
5. To support land use and transportation alternatives which enhance and maintain the livability of existing communities.
6. To discourage land development in areas where a project or its environs will experience severe adverse noise conditions.
7. To recognize the economic impacts of noise control and encourage an equitable distribution of these costs.
8. To recognize the citizens' concerns relating to unwanted sound levels, and to publicize avenues through which these concerns can be identified and mitigated.

Operational Objectives

1. To integrate the review of noise related impacts into the existing operational project review procedures of the County.
2. To incorporate noise information and acoustical studies into the County Environmental Impact Report process.
3. To adopt a series of noise contour maps for the administration of the State Department of Housing and Community Development guidelines on interior noise standards.
4. To consider noise impacts upon the natural environment, including impacts on wildlife.
5. To concentrate construction activities during the normal work hours of the day, so as to provide relative quiet during the more sensitive evening and early morning periods.
6. To design and construct public projects so as to cause as little as practical long-term noise inconvenience to existing residents.
7. To encourage noise mitigation features integral to the design and construction or as conditions of project approvals.
8. To coordinate with the cities, BART, and the State in the development of a multiphased action program to mitigate noise impacts.
9. To develop a noise abatement program consistent with State and Federal guidelines, which is (i) legally valid, (ii) not unduly costly, and (iii) does not impose undue hardships on landowners.

Policies

1. Require acoustical studies for major residential projects, at the minimum as required by the State of California, pursuant to the contours reflected in this element.
2. Recognize the need to consider noise impacts beyond their health effects.
3. Provide noise protection through methods which are also energy efficient and conserve natural resources.

4. In areas having exceptionally noise sensitive land uses, attempt to maintain outdoor noise levels below 45 dBA (CNEL).
5. In existing residential areas, attempt to maintain outdoor noise levels at the residences below 60 dBA (CNEL).
6. In newly developing residential areas, require that indoor noise levels not exceed 45 dBA (CNEL).
7. In newly developing residential areas, attempt to achieve outdoor noise levels at the residences below 60 dBA (CNEL).
8. Encourage location of sensitive land uses away from noise areas, or mitigate the impacts of noise on their uses.
9. Mitigate high existing noise levels to less than 70 dBA (CNEL).

IMPLEMENTATION OF THE NOISE ELEMENT

Numerous programs exist which relate to the implementation of policies enunciated in this Noise Element; others are needed to supplement existing programs as outlined below.

Acoustical Studies

The State Department of Housing and Community Development has adopted administrative guidelines giving maximum allowable noise levels for all residential structures, exclusive of detached single family homes. These provisions are contained in Title 25 of the California Administrative Code, and apply to single family attached units, apartments, hotels, and motels. (For the purpose of this program a detached single family dwelling is defined as any single family dwelling separated from adjacent property lines by 3 feet or more or separated from adjacent buildings by 6 feet or more.) They require that in all areas where the noise exceeds 60 dBA measured on the CNEL scale, an acoustical study is required. Acoustical studies are also required for nonresidential projects which cause residential noise levels to exceed that standard. The purpose of this study (which is to be conducted at the expense of the applicant) will be to insure that new structures built will not exceed interior noise equivalents of 45 dBA based on the CNEL scale with the windows closed. These acoustical analysis reports must be prepared under the supervision of a person experienced in the field of acoustical science and must be submitted with the application for a building permit.

The acoustical report must show topographical relationships of noise sources and dwelling sites, identification of noise sources and their characteristics, predicted noise spectra at the exterior of the proposed dwelling structure considering present and future land usage, basis for the prediction (measured or obtained from published data); noise attenuation measures to be applied, and an analysis of the noise insulation effectiveness of the proposed construction showing that the prescribed interior noise level requirements are met. If interior allowable noise levels are met by requiring that windows cannot be opened, the design for the structure must also specify the means that will be employed to provide ventilation and cooling, if necessary, so as to provide a habitable interior environment.

The owner or builder may employ any method of noise attenuation, so long as it is consistent with local regulations regarding land use and construction standards. Possible measures include masonry walls, fences, earthwork, landscaping, orientation of structures, distance between structures and noise

sources, insulation in walls, double pane windows, windowless walls, reflectivity of surfaces, absorptivity of surfaces, and a variety of other detailed design features which may be used to mitigate noise. Although the law makes no mention of aesthetics, it is recommended that design include this consideration since the structures will be relatively permanent.

In an effort to integrate noise information into the County's review process, and to minimize inconvenience to developers, this noise review should be included in the early project review rather than the later building permit level of investigation. Therefore, acoustical reports should be included in the Planning Agency review.

Areas for which acoustical reports are required will be determined by use of the 1990 contour maps; all projects covered by State Guidelines, and within an area with noise levels exceeding 60 dBA (CNEL), will require an acoustical study. Whenever a project is submitted for Planning Agency review, the project will be checked against the 1990 contour maps. Samples of full size 1975 and 1990 contour maps are shown in Appendix C, Map 2 through 26 are reductions of the detailed 1,000 foot scale 1990 administrative contour maps which will be maintained in the County's Planning and Building Inspection departments. These administrative maps will be utilized to implement this program.

1990 CNEL Contour Maps

The 1990 CNEL Contour Maps will also be utilized to identify projects which do not legally require acoustical studies, but which might benefit from such studies, based on individual circumstances.

Noise Ordinances

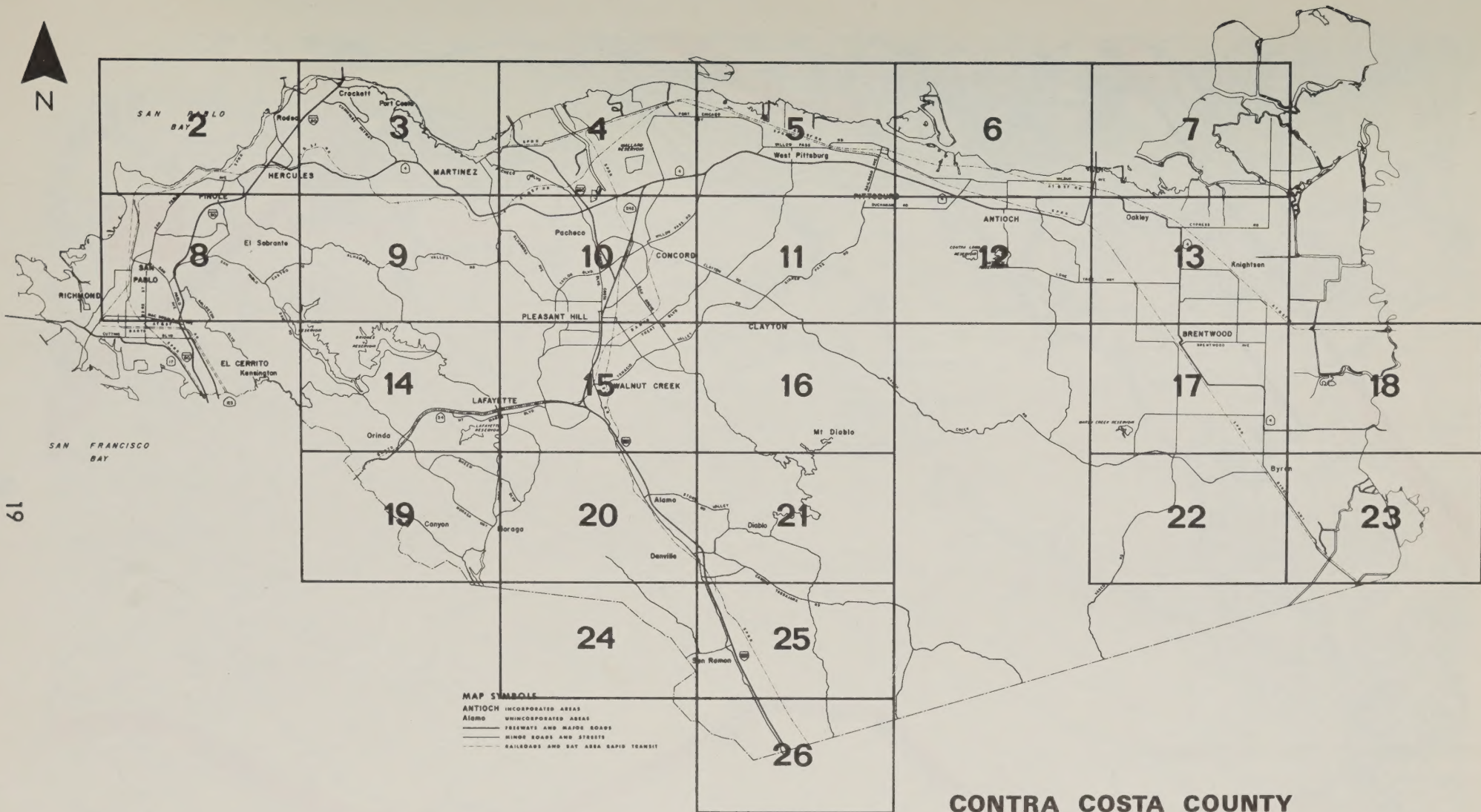
Various noise ordinances have been adopted by jurisdictions within the State, and a model noise ordinance has been developed by the California League of Cities. To date the effectiveness of noise ordinances has not been well established. Further research should be encouraged to investigate the benefits and effectiveness of this type of ordinance.

Noise Buffers

The California Department of Transportation is committed to installing noise buffers next to Charlotte Wood School in Danville and the Bay Area Rapid Transit District is considering the construction of noise barriers along the

noisy portions of the Concord line within the County. This is part of a remedial effort to handle known noise problems in areas impacted by noise from transportation facilities.

These corrective measures should be made part of a continuing program of noise buffer installations.



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KEY TO 1990 NOISE CONTOUR MAPS

The above key provides a locational guide to the 1990 noise contour maps which appear on the following pages. The maps have been reduced from their original 1" = 1000' scale, and are presented here for display purposes at a scale of approximately 1" = 3000'. Examples taken from the full size maps are contained in Appendix C. The full set of 1" = 1000' administrative noise contour maps is available in the Planning Department office.

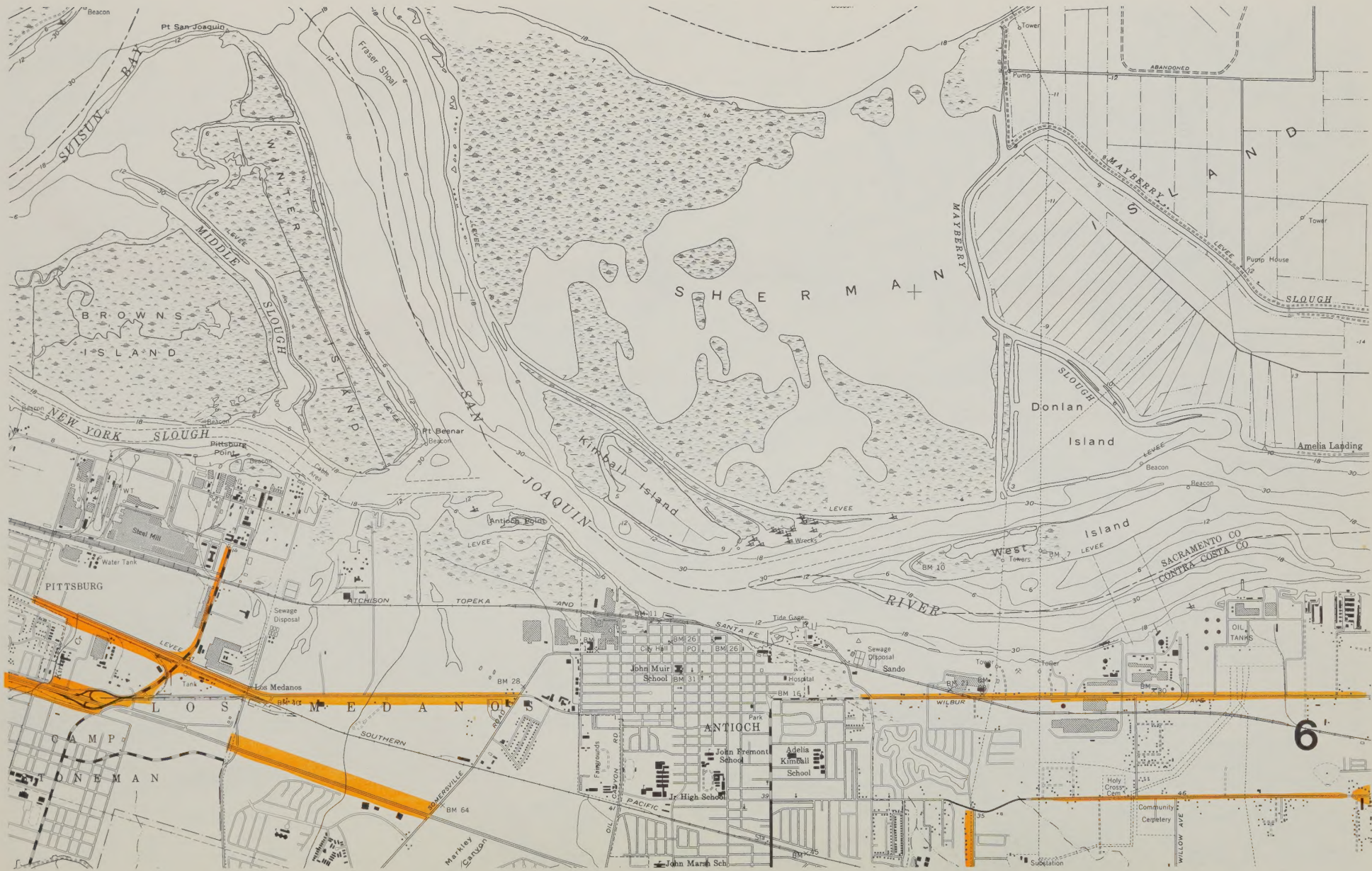
20



1990 60+ CNEL Levels

2





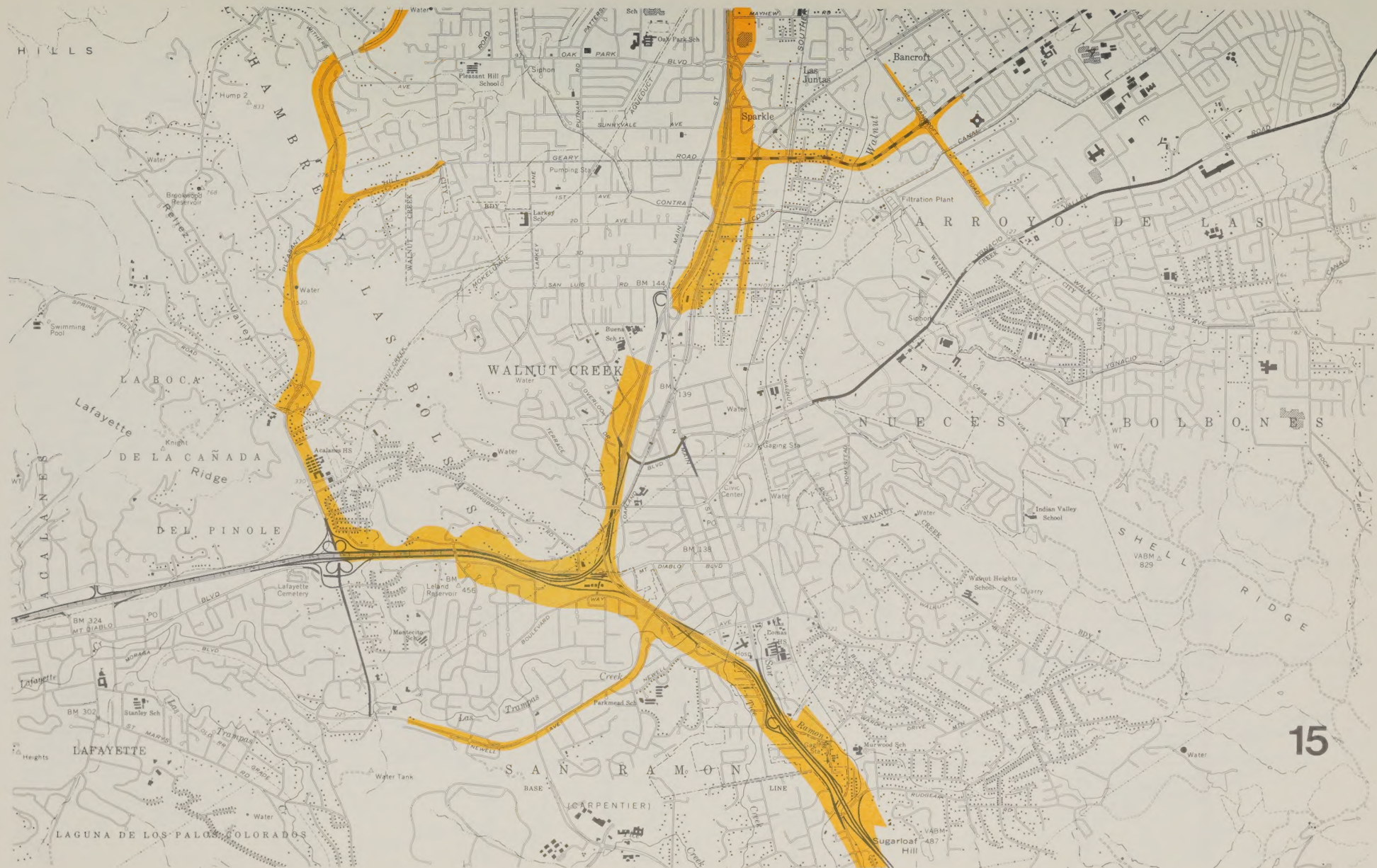




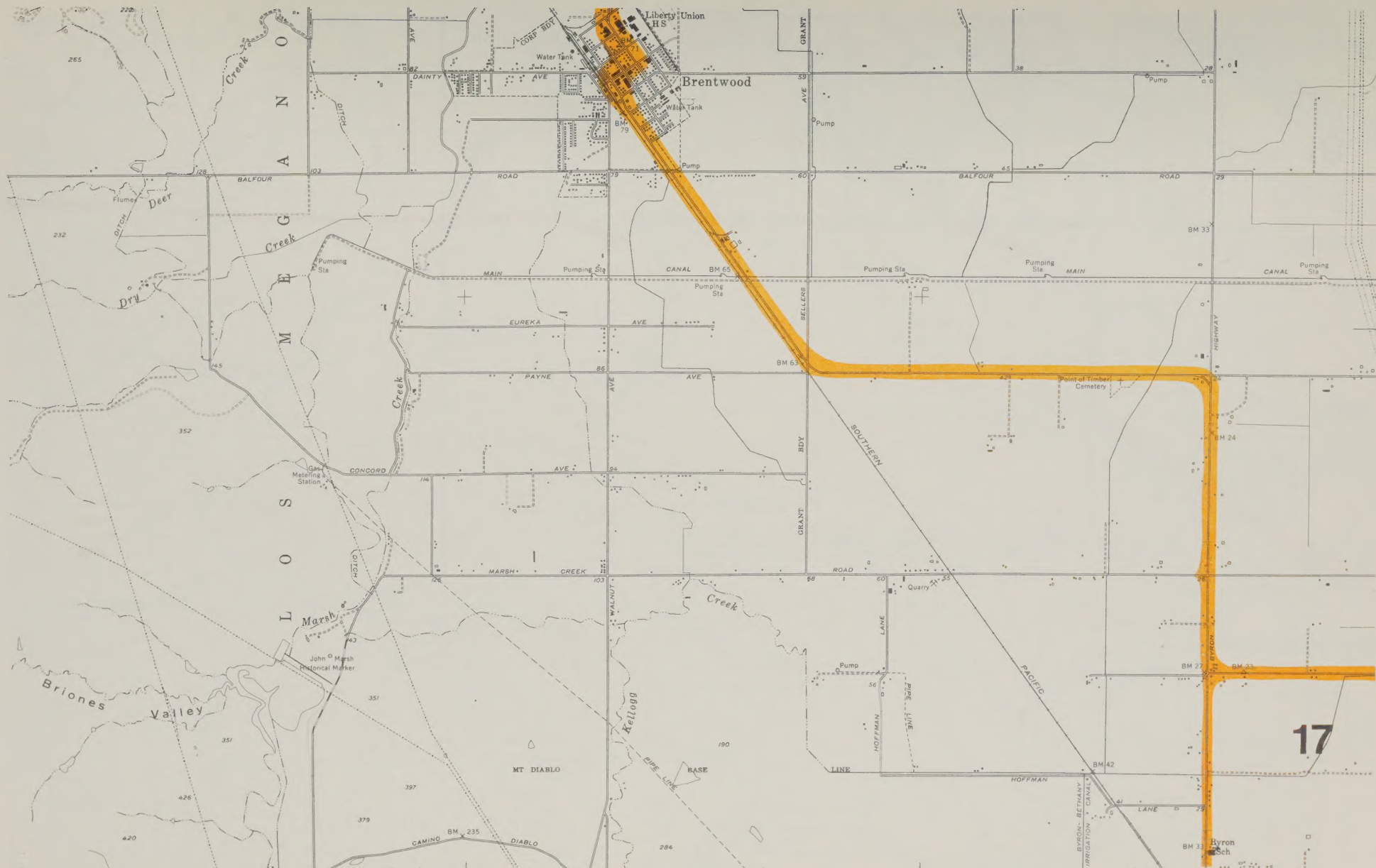


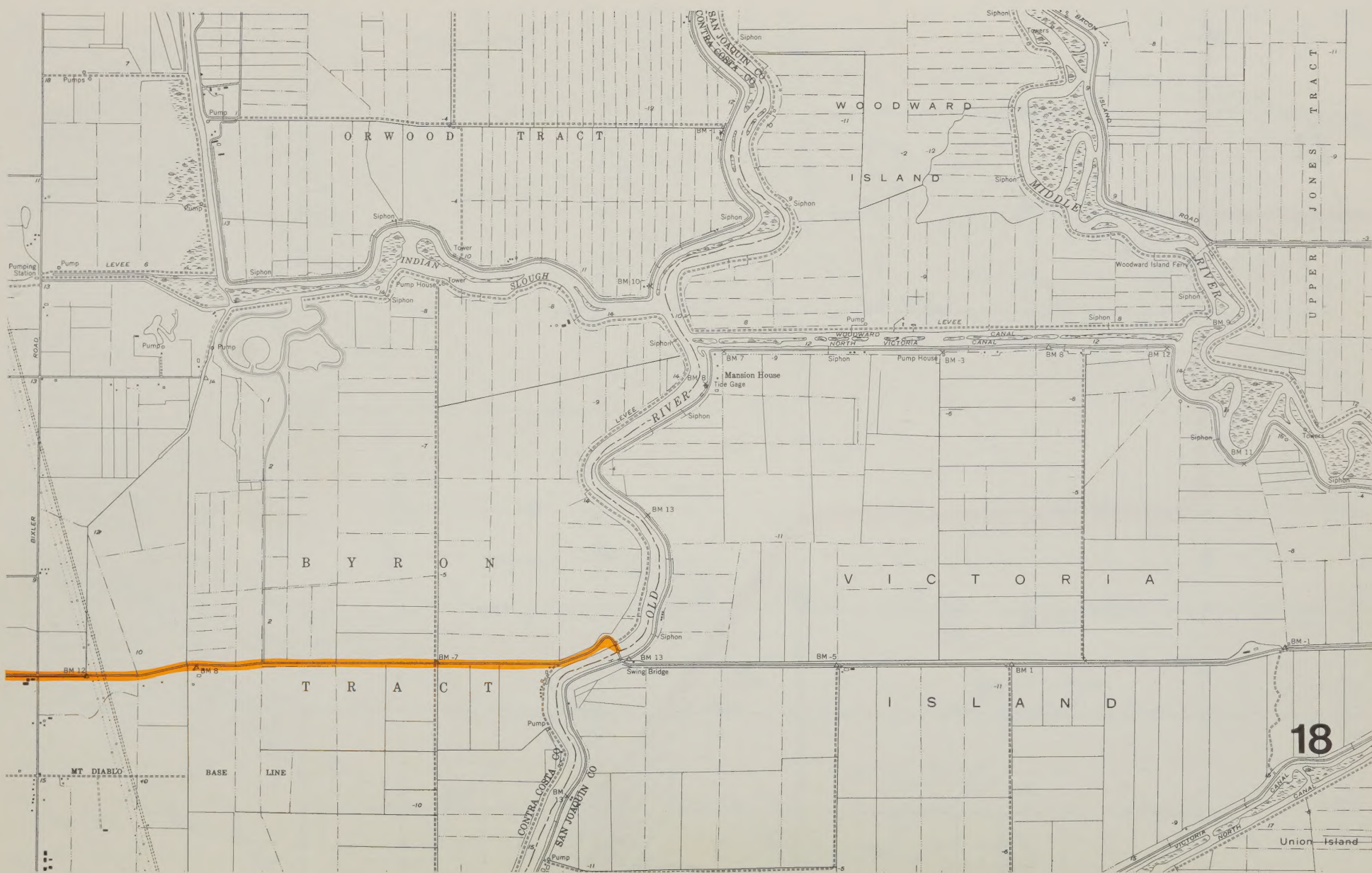






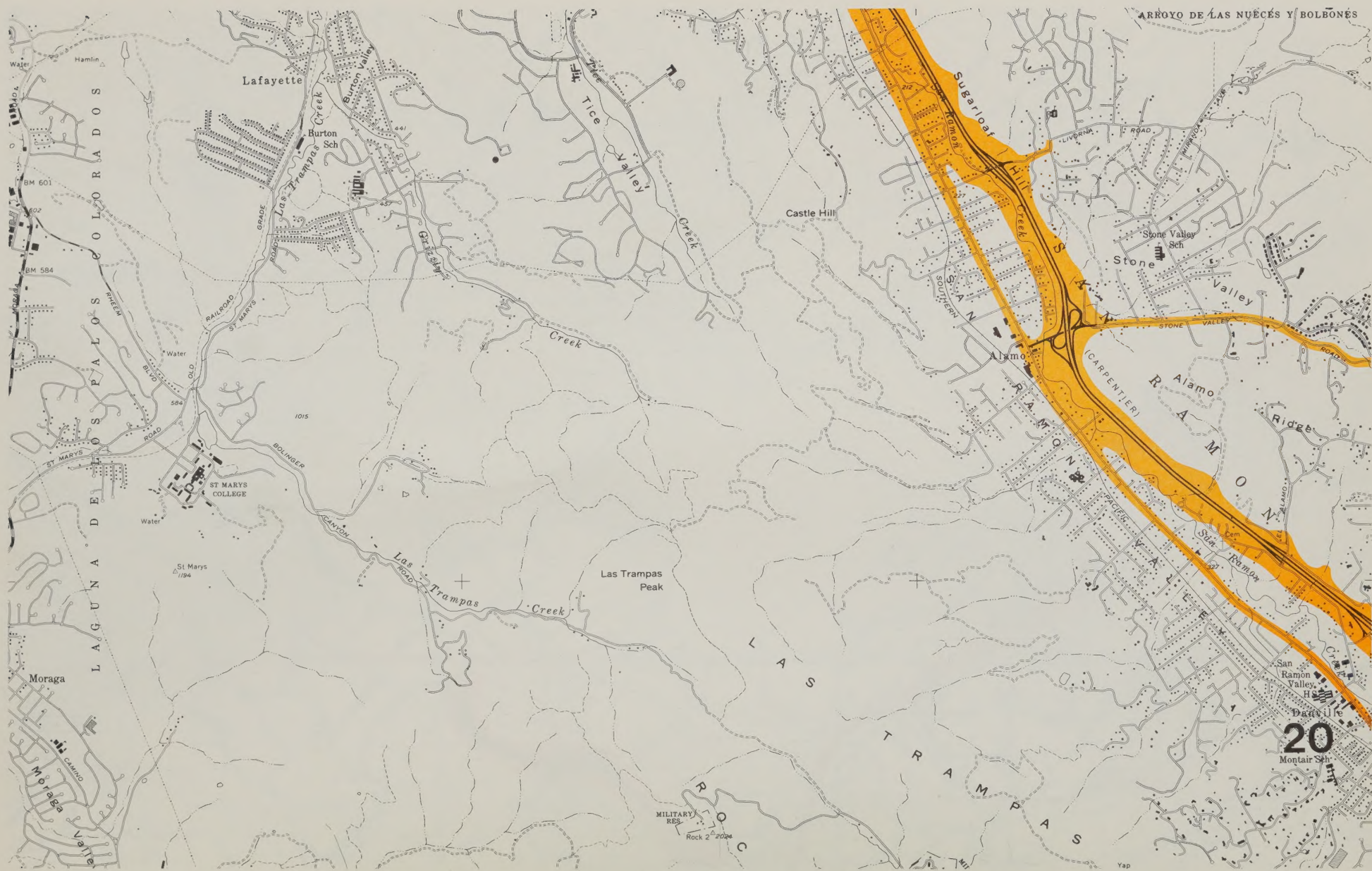




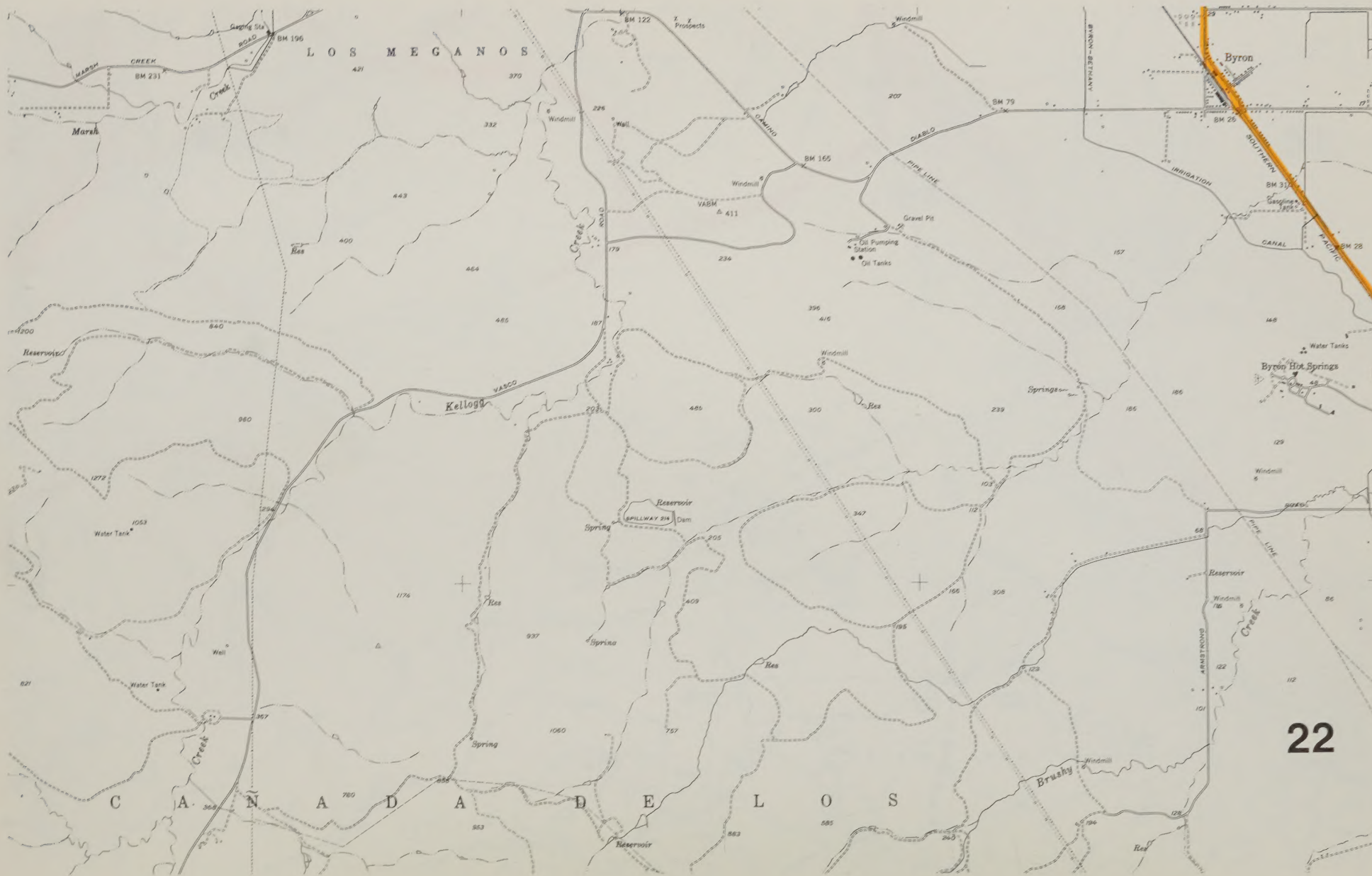


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APPENDICES

APPENDIX A: NOISE MEASUREMENT AND CONTOUR DEVELOPMENT

APPENDIX B: NOISE INVENTORY SITES

APPENDIX C: 1975 & 1990 NOISE CONTOUR SAMPLES

APPENDIX A

NOISE MEASUREMENT AND CONTOUR DEVELOPMENT

A. Collection and Synthesis of Field Data.

The measurement sites were chosen jointly with Contra Costa County Planning and Public Works Departments to acquire data in areas representative of a variety of land uses, including critical receptors, residential, state highways, major county roads and areas of high land development potential.

All Measurements Were of 15-Minute Duration.

The sound level acquisition system used was a Bruel and Kjaer Model 166B/S45 Environmental Noise Classifier. This noise monitoring instrument registers the time during which noise was measured in a particular noise level range as well as the total time of the monitoring sample. It was calibrated before each sample with a Bruel and Kjaer Sound Level Calibrator, Type 4230. The output of the noise classifier is a digital readout which is recorded directly from the face of the instrument onto a data record sheet. Each set of four boxes on the record sheet represents a dB range (shown below each set), while the numbers in each set represent the amount of time, in tenths of minutes, during which noise fell into the given range. The total sampling time is shown in the bottom center set. The instrument has ten adjustable base noise levels ranging from 45 dB to 100 dB. The A-weighting network was used for all measurements. In addition to the noise measurements, concurrent observations of meteorology, traffic volume and mix, road configuration and noise source characteristics were made for each of the 173 noise samples.

The data, once gathered, was fed into the computer and L_{eq} , L_{10} , and L_{50} were computed for each noise measurement. In the output of the Earth Metrics program, which made these calculations, the base level is listed first. The next line begins with a number which identifies the particular sample. It is followed by a listing of the time in minutes during which noise was measured in each of the twelve ranges. The thirteenth number is the total time of the sample. Next, the L_{eq} , L_{10} , and L_{50} are listed under their appropriate headings (the L_{10} and L_{50} are subsequently transferred to the data record sheet).

B. Collection and Synthesis of Data for Predictions.

In order that predictions of existing and future noise levels could be made for the main transportation network in Contra Costa County, it was necessary that certain information regarding traffic and roadway characteristics and configurations be obtained.

The Contra Costa County Departments of Public Works and Planning provided existing and projected ADT's (average daily traffic), speed, and truck mix information for the majority of the field sites and for the main transportation network as well. In cases where the data was not complete or was outdated, Earth Metrics used the results of traffic observations which accompanied the noise measurements to estimate existing traffic conditions. CALTRANS was helpful in providing some data on diurnal traffic variation for different road types in Contra Costa County (which were used in scaling up the field traffic counts to obtain ADT's when needed), as well as in choosing appropriate day, evening and night distributions for prediction of CNEL's.

Road characteristics and configurations, such as number of lanes, presence or absence of traffic lights, road conditions, road geometry and topography, were gathered from observations made in the field as well as from CALTRANS photographs.

BART provided existing and projected CNEL's for its trains.

C. Model Description.

Earth Metrics has developed a computer version of the model developed by Wyle Laboratories, Inc., El Segundo, California, for prediction of CNEL and L_{dn} from roadways. The Wyle model takes into consideration the following parameters:

- ADT (Average Daily Traffic)
- percentage of ADT occurring in daytime, evening, and nighttime periods
- vehicle speed
- number of lanes
- prediction year desired
- heavy duty vehicle mix
- road geometry

The Earth Metrics computer model also adds the capability of adjusting for topography. This modification is based on Highway Research Board Report 117. The model is accurate to ± 2 dBA.

The output of Earth Metrics' computer version shows a geographic identifier which will be explained in the next section. Next, the output shows, in tabular form, under the headings "dBA Level" and "CNEL Dist" the distances in feet at which the given dBA levels occur for a given CNEL. From these, contours can be developed directly. The table described is derived from data in a listing which shows distances, beginning with a reference distance of 50 feet, and the CNEL's at those distances are computed.

D. Calibration of the Model.

Examples of places in which the model has been tested and calibrated are Gilroy, San Jose, Hayward, Walnut Creek, and Clayton. It was calibrated again for the Contra Costa County noise element in Orinda near Highway 24. The topography adjacent to the freeway at this point is irregular. The results of the 24-hour field measurement of CNEL were within 1 dB of the predicted value at the same location.

E. Methodology of Noise Contour Development.

The base maps for the CNEL contours were standard U.S.G.S quadrangle maps with a scale of 1 inch to 1000 feet and were provided by the County Public Works Department. They were overlaid with frosted mylar. For the existing 1975 contours, 1/16 inch black tape was placed on the overlays. Separate overlays and red tape were used for the projected 1990 contours.

The model was run for each place on a given roadway where traffic, topography or road geometry changed significantly. A grid coordinate system was used for identifying each particular prediction. The first line of the model output is the identifier, and consists of a letter which identifies the map, three numbers which correspond to the east-west coordinate of the prediction location.

F. Method for Extending Contours Down to 45 dBA.

Given a road which is at grade, and unobstructed flat land on either side of the road, it is possible to estimate where the 45 CNEL contour is, provided other CNEL contour distances from the roadway are known. This is accomplished by the use of a standard curve.

G. Verification of State Noise Data.

At the present time, CALTRANS has not developed CNEL contours for the state highways; however, it has developed L₁₀ contours for all state roads. The CNEL contours which were completed for the Contra Costa County Noise Element were in general more detailed than the State L₁₀ contours since they took detailed topography as well as road geometry into account. For this reason, in some cases, the shapes of the County contours differ from the State's. Although L₁₀'s were not calculated for the county work, in general, the State L₁₀ values seem consistent with the CNEL values developed (generally, there is a 3 dB to 4 dB difference between L₁₀ and CNEL).

RESULTS OF 15-MINUTE MEASUREMENTS

The map in Appendix B summarizes the results of an extensive noise measurement effort conducted by the County as part of the data acquisition requirements for the Noise Element. Of the total of 87 sites, 85 were for 15-minute periods and two were for extended periods of up to 24 hours. The attached table contains a summarization of the 15 minute observations, including estimated CNELs for these sites. The results of the two extended measurements are provided in separate data sheets following the table.

Footnotes to the measurements.

- * The CNEL level shown is based on traffic from the first road listed in the description and is the level at 50 feet from the center of the near lane.
- ** The time shown is the beginning time of the 15-minute sampling period.
- + Traffic counts included all vehicles entering the intersection.
- ++ The distance shown is the distance from the center of the near lane.

RESULTS OF 15-MINUTE MEASUREMENTS

Site Description	Predicted CNEL*	Measured L ₁₀ (dBA)	Measured L ₅₀ (dBA)	Time**	Total Traffic Volume/15 min.+	Percent Trucks	Speed (mph)	Distance From Roadway (feet)++
2 Chesley at 3rd Street	70	81 80	71 69	2:20 p.m. 10:00 a.m.	179 138	12 12	4 way stop	10
3 San Pablo Dam Rd. at El Portal Dr.	68	72 74	67 68	12:20 p.m. 10:50 a.m.	341 335	1 3	30	25
4 Appian Way at San Pablo Dam Rd.	69	77 75	71 69	11:50 a.m. 12:00 p.m.	361 364	2 1	25	16
5 May Rd. at San Pablo Dam Rd.	67	75 74	66 65	10:00 a.m. 12:30 p.m.	137 190	1 4	35	12
6 Castro Ranch Rd at San Pablo Dam Rd.	64	69 70	59 60	9:35 a.m. 1:30 p.m.	88 108	0 6	40	35
7 Appian Way at La Paloma Rd.	65	74 76	70 67	11:20 a.m. 11:15 a.m.	147 156	2 6	30	23
8 Appian Way at Valley View Dr.	66	68 69	61 62	10:50 a.m. 1:00 p.m.	115 159	3 3	30	50
9 Corner of Parker, Willow & San Pablo	66	78 77	68 69	10:35 a.m. 11:35 a.m.	128 144	5 4	40	20
10 Pomona St. at 2nd Avenue	62	72 71	62 64	11:05 a.m. 12:25 p.m.	86 130	6 3	25	24
11 Arlington Ave. at Coventry Rd.	62	65 66	58 60	12:30 p.m. 9:50 a.m.	95 149	1 1	25	70
12 Arlington Ave. at Highland	63	70 66	58 54	3:10 p.m. 10:00 a.m.	69 43	6 5	25	15

RESULTS OF 15-MINUTE MEASUREMENTS

Site Description	Predicted CNEL*	Measured L ₁₀ (dBA)	Measured L ₅₀ (dBA)	Time**	Total Traffic Volume/15 min.+	Percent Trucks	Speed (mph)	Distance From Roadway (feet)++
13 Pinole Valley Rd. at Castro Ranch Rd.	53	62 64	53 54	9:10 a.m. 12:00 p.m.	16 34	0 3	35	25
14 Camino Pablo at Wildcat Canyon Rd.	69	73 68	60 56	1:00 p.m. 10:50 p.m.	75 73	12 4	45	30
15 Camino Pablo Rd. at Miner Rd.	65	69 68	61 62	12:50 p.m. 10:15 p.m.	118 144	3 4	30	15
16 Camino Pablo Rd. at Brookwood	67	69 65	62 59	9:55 a.m. 11:15 a.m.	221 356	3 2	30	35
17 Upton Rd. at Gateway Blvd.	58	63 60	58 56	11:40 a.m. 9:40 a.m.	0 1	0 0	20	15
18 Brookside Rd. at Moraga Way	66	76 77	68 69	10:45 a.m. 12:30 p.m.	217 200	2 6	35	15
19 Moraga Way at Glorietta	67	69 71	61 61	11:10 a.m. 12:55 p.m.	166 184	2 6	35	16
20 Pleasant Hill at Stanley	69	80 78	72 69	3:00 p.m. 1:30 p.m.	487 298	2 2	35	11
21 Pleasant Hill at Withers	61	69 68	58 56	2:00 p.m. 11:00 a.m.	89 73	2 3	35	15
22 Taylor 1/4 mi. south of Withers	70	79 78	68 66	1:15 p.m. 2:00 p.m.	175 173	2 1	45	11
23 Reliez Valley Rd at Cementary Entrance	59	64 67	54 54	2:30 p.m. 12:20 p.m.	21 27	10 11	25	17
24 Reliez Valley Rd at Donegal Way	55	63 65	54 54	2:10 p.m. 2:45 p.m.	20 33	0 9	35	11

RESULTS OF 15-MINUTE MEASUREMENTS

Site Description	Predicted CNEL*	Measured L ₁₀ (dBA)	Measured L ₅₀ (dBA)	Time**	Total Traffic Volume/15 min.+	Percent Trucks	Speed (mph)	Distance From Roadway (feet) ++
25 Reliez Valley Rd. at Alhambra Valley Rd.	57	67 68	55 56	1:50 p.m. 3:30 p.m.	45 52	2 4	40	15
26 Waterfront Rd. at Payton Overcrossing	59	70 68	55 53	9:30 a.m. 11:10 a.m.	40 24	3 8	35	12
27 Arthur Rd. at Central Ave.	58	77 77	65 65	10:50 a.m. 11:40 a.m.	47 69	49 30	25	13
28 Pacheco Blvd. between Morello and Arthur	67	79 79	71 70	11:20 a.m. 12:10 p.m.	235 233	3 3	35	13
29 Morello Ave. at Midhill Rd.	54	64 57	54 52	11:45 a.m. 10:35 a.m.	25 13	4 0	35	10
30 Center Ave. at Pacheco Blvd.	64	78 79	71 70	12:45 p.m. 9:45 a.m.	348 241	1 3	40	25
31 Center at Canal	61	70 68	58 56	1:10 p.m. 10:00 a.m.	87 59	2 2	30	17
32 Treat at Buskirk	66	77 75	70 69	12:45 p.m. 10:30 a.m.	385 388	4 4	30	17
33 Buskirk at Coggins	67	76 71	69 64	1:20 p.m. 9:40 a.m.	215 170	4 6	30	13
34 Treat at Rail- road tracks	69	77 79	66 69	1:10 p.m. 12:30 p.m.	266 282	1 5	35	15
35 Ygnacio Valley Rd. at Bancroft	65	73 69	67 64	10:50 a.m. 12:30 p.m.	498 510	3 1	35	43

RESULTS OF 15-MINUTE MEASUREMENTS

Site Description	Predicted CNEL*	Measured L ₁₀ (dBA)	Measured L ₅₀ (dBA)	Time**	Total Traffic Volume/15 min.+	Percent Trucks	Speed (mph)	Distance From Roadway (feet) ++
36 Oak Grove at North Gate	59	67 67	62 57	10:30 a.m. 1:20 p.m.	45 68	9 3	25	24
37 La Casa Via 1/4 mile south of Ygnacio Valley	47	62 65	52 59	10:00 a.m. 1:00 p.m.	4 6	0 0	20	17
38 Newell at Lilac Dr.	64	71 72	63 63	9:10 a.m. 2:00 p.m.	133 120	5 1	30	12
39 Olympic Blvd. 1/4 mile east of Tice Valley Blvd.	61	72 75	64 68	9:40 a.m. 2:20 p.m.	209 241	1 1	30	18
40 Livorna at Wilson	58	64 64	56 56	3:00 p.m. 2:30 p.m.	55 35	0 6	20	4
41 Miranda at Livorna	58	58 60	53 54	2:30 p.m. 3:00 p.m.	9 20	0 10	20	10
42 Livorna at Danville Blvd.	61	74 74	68 65	3:30 p.m. 2:00 p.m.	221 142	0 4	45	26
43 Danville Blvd. at Hillgrade Ave.	66	76 75	66 65	8:45 a.m. 2:50 p.m.	145 132	1 3	45	21
44 Stone Valley Rd. at Austin Lane	63	76 76	64 65	1:30 p.m. 11:00 a.m.	129 144	1 4	35	9
45 Stone Valley Rd. at Roundhill	61	74 71	63 59	12:40 p.m. 10:18 a.m.	103 81	1 7	35	11

RESULTS OF 15-MINUTE MEASUREMENTS

Site Description	Predicted CNEL*	Measured L ₁₀ (dBA)	Measured L ₅₀ (dBA)	Time**	Total Traffic Volume/15 min.+	Percent Trucks	Speed (mph)	Distance From Roadway (feet)++
46 Stone Valley Rd. at Winding Glen	59	73 75	61 62	12:10 p.m. 10:00 a.m.	50 68	0 3	35	16
47 Stone Valley Rd. at Monte Vista H.S.	60	70 70	54 56	11:45 a.m. 9:30 a.m.	37 47	0 4	35	15
48 El Cerro Blvd. at Danville Blvd.	65	67 68	59 62	10:15 a.m. 12:15 p.m.	107 178	3 3	30	16
49 Stone Valley Rd. at Danville Blvd.	63	75 76	68 68	2:00 p.m. 11:50 a.m.	253 289	0 4	35	9
50 Railroad Ave. at Prospect	53	61 71	55 65	9:50 a.m. 3:10 p.m.	29 56	0 2	20	12
51 San Ramon Valley Blvd. at Midland Way	67	71 77	65 70	9:20 a.m. 12:50 p.m.	68 124	1 4	45	26
52 San Ramon Blvd. at Old Crow Canyon Rd.	65	72 74	64 68	11:00 a.m. 11:50 a.m.	121 178	3 3	35	25
53 San Ramon Valley Blvd. at Norris Canyon Rd.	66	75 72 77	65 63 63	12:00 p.m. 11:40 a.m. 11:05 a.m.	78 76 72	0 1 8	45	18
54 San Ramon Valley Blvd. at Montevideo Dr.	65	76 76	66 67	12:25 p.m. 10:20 a.m.	76 55	1 9	45	15
55 San Ramon Valley at Alcosta Blvd.	62	69 75	62 66	1:30 p.m. 10:00 a.m.	185 103	0 4	25	25
56 Montevideo Dr. at Railroad crossing	57	59 61	53 53	12:50 p.m. 10:45 a.m.	10 8	0 0	45	18

RESULTS OF 15-MINUTE MEASUREMENTS

Site Description	Predicted CNEL*	Measured L ₁₀ (dBA)	Measured L ₅₀ (dBA)	Time**	Total Traffic Volume/15 min.+	Percent Trucks	Speed (mph)	Distance From Roadway (feet)++
57 Village Parkway at Alcosta Blvd.	59	70 69	64 60	2:00 p.m. 9:30 a.m.	189 93	1 1	35	40
58 Crow Canyon Rd. at S.P. Railroad crossing	54	59 67	53 59	10:40 a.m. 12:15 p.m.	7 7	0 0	10	12
59 Dougherty Rd. 3/8 mile south of Camino Tassajara	48	59 58	54 53	3:00 p.m. 8:20 a.m.	6 4	0 0	40	9
60 Camino Tassajara at Sycamore Valley Rd.	53	65 59	54 53	10:45 a.m. 1:15 p.m.	30 19	0 0	35	40
61 Blackhawk Rd. 3/4 mile east of Mt. Diablo	50	60 56	53 53	11:15 a.m. 1:40 p.m.	8 6	0 17	40	11
62 Camino Tassajara 1/4 mile west of Lawrence	55	61 60	54 53	2:30 p.m. 8:45 a.m.	15 10	13 0	30	9
63 Ygnacio Valley Rd. at the landslide	67	76 80	63 71	9:40 a.m. 5:00 p.m.	162 427	1 1	55	18
64 Kirker Pass Rd. at Concord Blvd.	67	76 79	63 71	10:30 a.m. 4:10 p.m.	131 333	5 1	55	16
65 Baily Rd. 1/2 mile south of Highway 4	57	66 70	54 56	2:45 p.m. 3:00 p.m.	31 43	0 2	40	12
66 Willow Pass Rd. at Marin	70	78 77	70 69	1:40 p.m. 2:20 p.m.	206 192	4 7	45	20

RESULTS OF 15-MINUTE MEASUREMENTS

Site Description		Predicted CNEL*	Measured L ₁₀ (dBA)	Measured L ₅₀ (dBA)	Time**	Total Traffic Volume/15 min.+	Percent Trucks	Speed (mph)	Distance From Roadway (feet)++
67	Willow Pass Rd. at Baily	67	79	70	2:00 p.m.	204	3	35	30
			79	70	2:45 p.m.	255	4		
68	Willow Pass Rd. at North Parkside	67	78	67	2:30 p.m.	104	5	50	12
			78	67	2:00 p.m.	111	9		
69	Pittsburg-Antioch Hwy. at California Ave.	69	79	69	12:00 p.m.	166	0	45	15
			79	66	1:30 p.m.	121	3		
70	Somersville Rd. at S.P. Railroad crossing	65	78	69	11:25 a.m.	186	2	35	15
			77	69	1:00 p.m.	203	3		
71	Buchanan Rd. at Standard Oil Ave.	65	78	67	3:20 p.m.	127	5	45	15
			78	64	3:30 p.m.	131	2		
72	Deer Valley Rd. at Lone Tree Way	54	69	55	11:15 a.m.	45	2	55	24
			72	56	12:30 p.m.	50	2		
73	Lone Tree Way at Fairview Dr.	67	71	60	11:45 a.m.	79	8	45	16
			70	59	11:50 a.m.	75	4		
74	Cypress Rd. at Santa Fe Railroad crossing	60	68	57	12:15 p.m.	44	0	45	13
			70	56	11:30 a.m.	56	0		
75	Bethel Island Rd. at the bridge	62	70	58	12:40 p.m.	63	6	30	13
			69	59	10:55 a.m.	58	5		
76	Marsh Creek Rd. at Walnut Blvd.	57	68	56	1:20 p.m.	28	7	4 way stop	20
			65	55	10:20 a.m.	25	4		

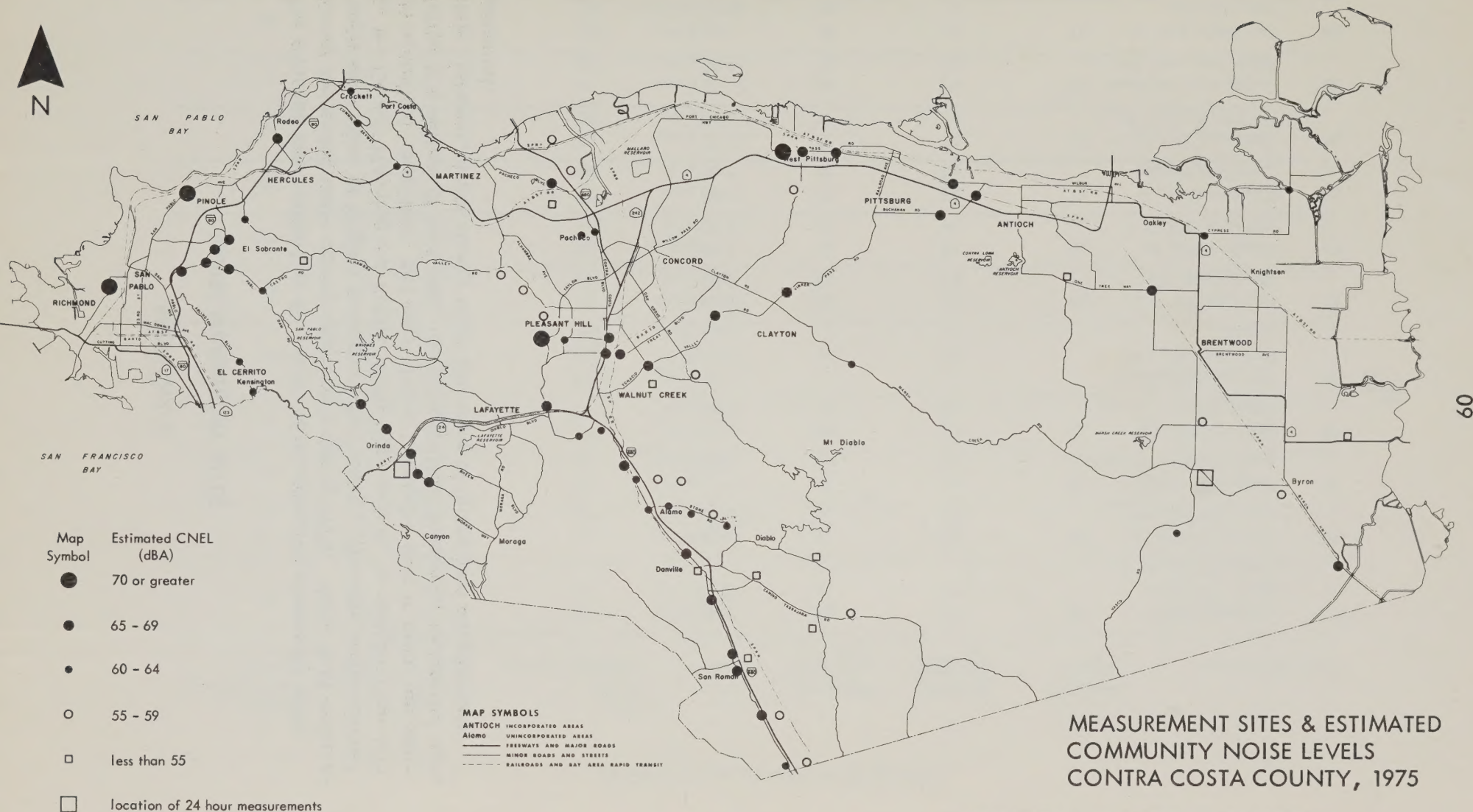
RESULTS OF 15-MINUTE MEASUREMENTS

Site Description	Predicted CNEL*	Measured L ₁₀ (dBA)	Measured L ₅₀ (dBA)	Time**	Total Traffic Volume/15 min.+	Percent Trucks	Speed (mph)	Distance From Roadway (feet)++
77 Discovery Bay Blvd. 1/4 miles north of Highway 4	53	56 61	52 54	2:00 p.m. 9:50 a.m.	6 3	0 0	30	13
78 Camino Diablo 1/2 mile west Byron Hwy.	58	58 61	52 54	3:00 p.m. 8:50 a.m.	10 10	0 20	50	8
79 Vasco Rd. 2 miles south of Camino Diablo	60	64 62	54 54	3:20 p.m. 8:20 a.m.	17 6	6 33	50	10
80 Byron Highway at Holey Road	65	67 70	53 54	2:30 p.m. 9:30 a.m.	18 35	39 40	55	25
80 Noise measurement from train alone at site 80		86	82	9:20 a.m. (1.6 min. sample)	train cars 88		40	240
81 Pine Lane at Marsh Creek Rd.	62	67 69	55 55	10:05 a.m. 4:30 p.m.	27 48	7 2	45	11
82 Pinole Valley Rd. at Pinole H.S.	63	75 74	67 64	1:10 p.m. 11:10 a.m.	185 159	0 0	35	11
83 Crockett Blvd. at Cummings Skyway	61	65 68	53 56	12:00 p.m. 5:50 p.m.	26 40	4 0	55	24
84 Cummings Skyway at Franklin Canyon Rd.	61	61 67	53 57	12:25 p.m. 6:10 p.m.	20 36	0 0	45	23
85 Loring Ave. between Ralph Ave. and 4th Ave.	57	65 65	60 58	11:35 a.m. 12:50 p.m.	19 22	5 0	25	11
86 San Pablo Ave. at Tara Hills Dr.	71	76 71	69 64	1:40 p.m. 10:35 a.m.	239 179	2 1	50	30

APPENDIX B

NOISE INVENTORY SITES

The attached map summarizes the results of an extensive community noise survey conducted under county sponsorship during 1975. These field measurements were taken at 85 sites throughout the County. The sites were selected by the County Planning and Public Works Departments, in collaboration with an acoustical consultant, and were chosen to acquire data in areas representative of a variety of land uses, including critical receptors, residential uses, state highways, major county roads and areas of future land development potential.

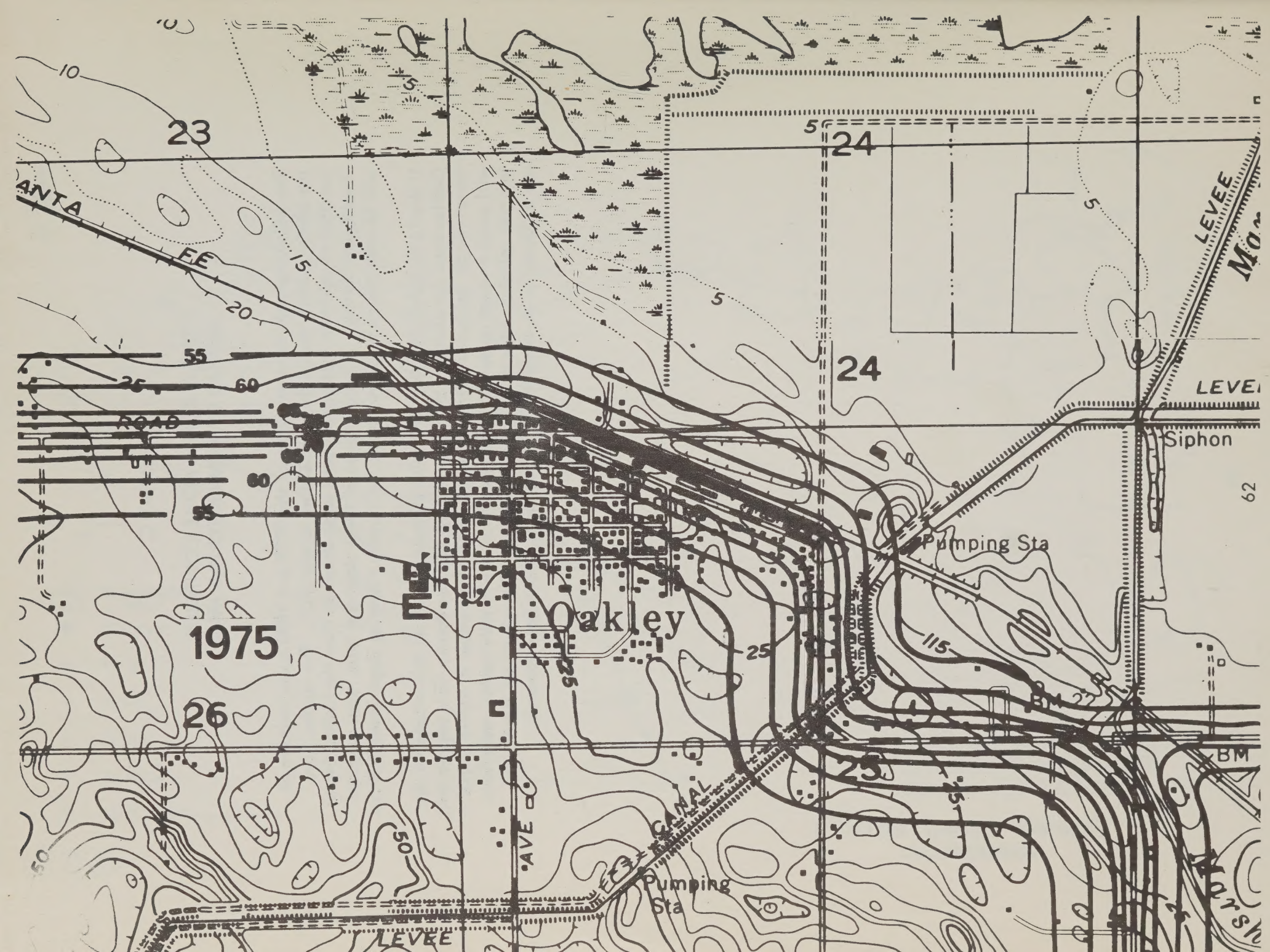


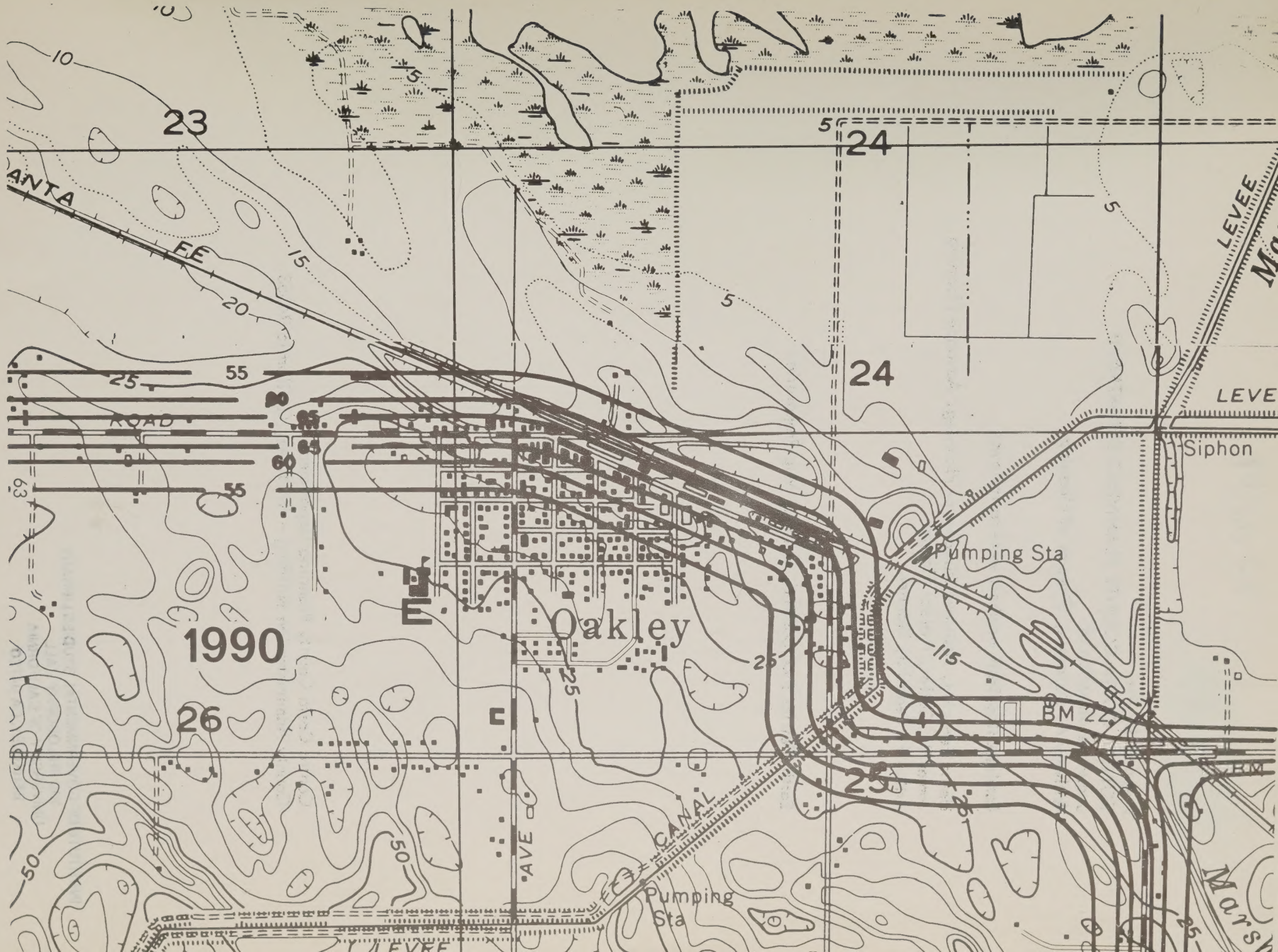
APPENDIX C

1975 AND 1990 NOISE CONTOURS SAMPLES OF ADMINISTRATIVE MAPS

The following maps show examples of the 1975 and 1990 noise contours at the administrative map scale of 1000 feet to one inch. The contours are overlaid on standard topographic base maps obtained from the United States Geological Survey. A complete set of these maps and their noise overlays will be maintained for reference in the County Planning Department Office.

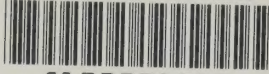
It should be noted that the 1990 noise contours shown on this sample for the Oakley area are narrower than the existing 1975 contours. This implies that there will be less noise in the future, in spite of increases in traffic. This will occur in most areas of the County and is due to anticipated reductions in noise emissions from vehicles in the future. Governmental regulations are expected to be the primary motivation for these improvements.





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